Natural Sciences 102 -- Spring 2004

Homework #6, May 4, 2004
Due in class May 11, 2004

1. An essay question:

Last week you wrote about the penultimate paragraph of Steven Weinberg's *The First Three Minutes*, which contains the statement, "The more the universe seems comprehensible, the more it also seems pointless." In the last paragraph, Weinberg writes,

> But if there is no solace to the fruits of our research, there is at least some consolation in the research itself. Men and women are not content to comfort themselves with tales of gods and giants, or to confine their thought to the daily affairs of life; they also build satellites and telescopes and accelerators, and sit at their desks for endless hours working out the meaning of the data they gather. The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy.

Again, in one paragraph, tell me your feelings about this statement.

2. The distance ladder:

In no more than one page, describe the steps on the cosmological distance ladder. Start with the radius of Earth, and end with the most distant objects we see. For each step, be sure to say exactly what is measured. For each step, describe what is used from the previous step.

3. Hertzsprung-Russell: (Please show your work.)

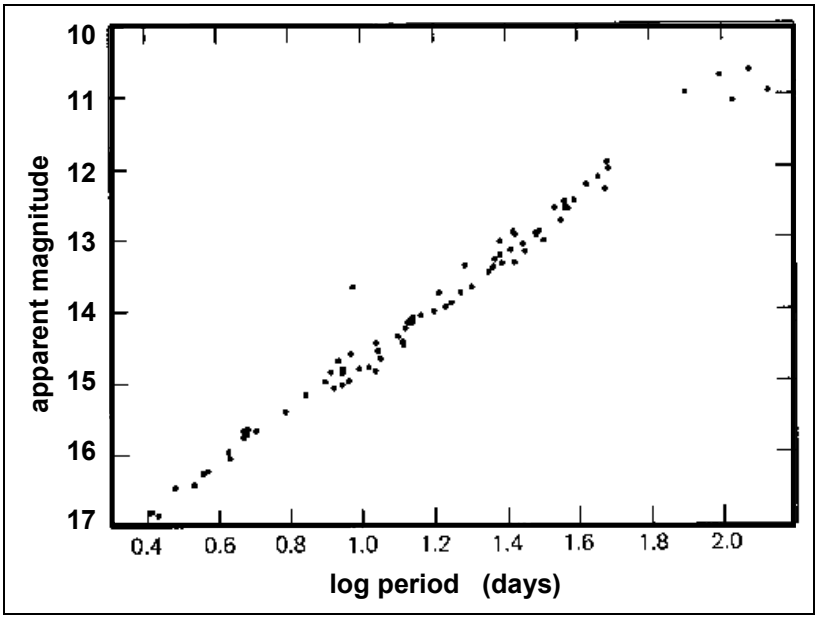
Last night my assistant (I don't do telescopes; I have people for that) discovered a globular cluster (named Rocky-II) in our galaxy, but it is too far away to detect a parallax.

a) What observations will my assistant have to do to establish the H-R diagram for Rocky-II?
b) How will the H-R diagram for Rocky-II be used to determine its distance?

(over)

4. Distances: (Please show your work.)

A Cepheid is discovered in the galaxy M137 with a period of 10 days and an apparent magnitude of m=20. Using the information about Cepheids in the LMC (distance 50 kpc) shown in the graph below, estimate the distance to M137.



News of the week

- The class website is: http://home.fnal.gov/~rocky/natsci102/.
- It would be good if you review your math textbooks about the properties of logarithms.
- This week's laboratory will be the first week of "Geometry of the Universe."
- May's reading assignment is Kolb, Chapters 6-11; Hogan, the entire book.